

REMARKS/ARGUMENTS

Claims 1-22 are pending in this application. By this Amendment, the specification is amended for clarity.

The courtesies extended to Applicant's representative by Examiner Chou at the telephone interview held March 31, 2008, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicant's record of the interview.

Objections to the Specification

In section 2 on pages 2-4, the Office Action objects to the specification for the specified reasons. The Examiner Chou is thanked for clarifying during the March 31, 2008, telephone interview that the basis for the objection to the specification pertains to the recitation in claim 18 of "an ideal offset filter." Thus, at the top of page 3, the Office Action quotes in its entirety paragraph [0034] of the specification where the ideal offset filter is introduced and discussed. The specification is amended to correct a typographical error in paragraph [0034] as originally filed.

In particular, as originally filed the paragraph inadvertently omitted the application number of the co-pending U.S. Application incorporated by reference therein. That application number is identified by the amendment to paragraph [0034] herein. Applicant respectfully

submits that the co-pending U.S. Application incorporated by reference provides the explanation of the ideal offset filter sought by Examiner Chou in all of the questions included in the objection to the specification on pages 2-4 of the Office Action.

For at least the foregoing reasons, it is respectfully requested that the objection to the specification be withdrawn.

In section 3 on pages 4-5, the Office Action objects to the drawings for the specified reasons. Examiner Chou is thanked for the March 31, 2008, telephone interview discussing this objection. Examiner Chou is further thanked for agreeing during the March 31, 2008, telephone interview the Applicant's purposed amendment to paragraph [0027] of the specification would overcome this objection. Accordingly, paragraph [0027] is amended exactly as proposed during the March 31, 2008, telephone interview.

For at least foregoing reason, is respectfully requested that the objection to the Figures be withdrawn.

In section 4 on pages 5-6, the Office Action rejects claim 16 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. This rejection is respectfully traversed for at least the following reasons.

Examiner Chou is thanked for clarifying during the March 31, 2008, telephone interview that the language in claim 16 giving rise to the rejection under 35 U.S.C. § 112, second paragraph, is the recitation of, "an ideal offset filer." Applicant respectfully submits that the amendment to the specification correcting the typographical error in the incorporation by reference included in the originally filed paragraph [0034] addresses this issue. In particular, the

subject matter of the co-pending U.S. Application incorporated by reference clearly and definitely describes the ideal offset filter recited in claim 16.

For at least the foregoing reasons, it is respectfully requested that the rejection of claim 16 under 35 U.S.C. § 112, second paragraph, be withdrawn.

In section 5 on pages 6-10, the Office Action rejects claim 1-8 and 10-22 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,839,703 to Jinzaki (hereinafter "Jinzaki") in view of U.S. Patent Publication No. 2005/0086520 to Dharmapurikar et al. (hereinafter "Dharmapurikar"), and further in view of U.S. Patent No. 7,219,184 to Stojancic. This rejection is respectfully traversed for at least the following reasons.

The subject matter of the rejection claims pertains to multiple retrievals into multiple tables in a serial fashion. Retrieval results are combined (ANDed) to provide the identities of the final hash tables to look into (Prefix length tables). Sub-Keys are obtained from original KEY using a combing mechanism (to create diversity in sub-key distribution). The original KEY is used in the final retrievals in the final hash tables (A table for each prefix length). Only a subset of prefix length tables are searched (ideally one due to the diversity of the comb).

In contrast, Jinzaki discloses multiple retrievals into multiple tables with variable length sub-keys in a serial fashion. A retrieval results in either a final match or in a pointer within the next table. Sub-Keys are obtained by dividing the initial KEY into smaller parts (No diversity of sub-keys). Final lookup is based on only the previous lookup and the final sub-key. In other words, Jinzaki discloses a compressed tree lookup algorithm in which a larger and larger portion of the key is used to traverse the tree.

Further, according to the subject matter recited in the rejected claims, a single large pool of memory used for a single hash table which contains all prefixes. This means that there is no limit on the number of prefixes of a given size. A search of prefix lengths returned by filtering is performed serially for a single key in order to minimize the total number of memory accesses. This requires no additional logic to resolve multiple matches.

The subject matter of the rejected claims is used for longest prefix matching from a given set of bits. In contrast, the disclosure of Dharmapurikar pertains to longest prefix matching using bloom filters. This is referenced in the specification as an example of what the subject matter recited in the rejected claims improves upon.

Bloom filters are used to determine a set of eligible prefix lengths, and then these lengths are searched linearly until a match is found. The subject matter recited in the rejected claims uses a different mechanism to select which lengths to search, and searches these lengths using a binary search method.

Put differently, bloom filters determine whether a single given length would match a given key with some probability. When using bloom filters, all possible lengths need to be checked to come up with a set of potential lengths. The subject matter recited in the rejected claims uses a different filtering mechanism to return a set of potential lengths. Several sets of these filters can be used to reduce the number of potential lengths. Additionally, instead of simply returning a list of lengths which need to be searched linearly, the filtering can return a search tree which indicates the set of lengths, and the order in which they should be searched.

Accordingly, the disclosure of Dharmapurikar pertains to finding fixed strings in a packet payload which start at arbitrary positions in the packet. Dharmapurikar discloses the use of bloom filters that only indicate whether a key is a member of a set. For LPM, some information would need to be returned to indicate the next-hop for the given key. Removal of an element from a bloom filter is impossible without rebuilding the entire bloom filter, which makes it unsuitable for LPM matching of IP addresses as routing tables can be constantly changing.

Bloom filters have the possibility of false positives which is unacceptable for routing table lookups. Accordingly, the subject matter recited in the rejected claims permits a second analyzer performing a "deterministic string matching algorithm" to confirm whether the match is valid or a false positive. Applying this to LPM would be pointless as every key must have a match, so the use of the bloom filter to reduce the number of "hits" would be useless as every key would hit something.

The disclosure of Stojancic relies on hardware mechanisms to do a search a single key using a "plurality of prefix search engines" in parallel. Basically this means there are a several sets of memory banks that are searched in parallel. Accordingly, Stojancic is limited by the total memory and is also limited by the size of each bank.

Each prefix search engine disclosed in Stojancic only performs searches based on a single "prefix key length." Accordingly, the claims of Stojancic recite having a second prefix key length for each, but the search is only performed on the shorter of the two keys.

Further, each prefix search engine disclosed in Stojancic is comprised of a set of memory banks. The number of prefixed of that length is limited by the size of the memory banks for that search engine.

The subject matter disclosed in Stojancic requires a "priority controller" to resolve simultaneous matches and find the longest matched prefix key. This is a consequence of doing multiple searches in parallel. Thus, Stojancic directly teaches away from the subject matter recited in the rejected claims.

Also, the subject matter of Stojancic is based on a "residue number system" to uniquely index the set of memory banks.

For at least the foregoing reasons it is respectfully requested that the rejection of claims 1-8 and 10-22 as allegedly being unpatentable over Jinzaki in view of Dharmapurikar and further in view of Stojancic be withdrawn.

In section 6 on pages 10-11, the Office Action rejects claim 9 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Jinzaki, in view of Dharmapurikar and Stojancic, and further in view of U.S. No. 6,947,931 to Bass et al. (hereinafter "Bass"). This rejection is respectively traversed for at least for following reasons.

Claim 9 is allowable based on at least on its dependence from claim 1 and 7 for at least the reasons stated above in connection with the rejection of claims 1 and 7. Bass fails to overcome the deficiencies in Jinzaki, Dharmapurikar and Stojancic discussed above.

Further, according to the subject matter recited in claim 9, no trees are used at all. Only a sequence of combing and lookups into the filter tables, ANDing of filters results, and serial hash

lookups based on set of prefix lengths indicated by filtering are used according to the subject matter recited in the rejected claims. In contrast, Bass discloses a tree structure with pointers and leafs used (PSCC tree) for a serial walk in the tree. *See, e.g.*, preferred embodiment in FIG. 5.

For at least for forgoing reasons, it is respectfully requested the rejection of claim 9 as allegedly being unpatentable over Jinzaki in view of Dharmapurikar, Stojancic and Bass be withdrawn.

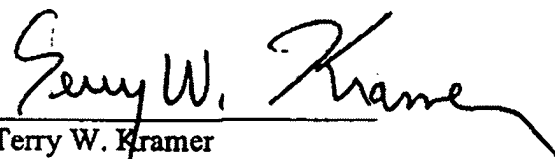
CONCLUSION

While we believe that the instant amendment places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is respectfully requested that the Examiner telephone the undersigned attorney in order to expeditiously resolve any outstanding issues.

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Respectfully submitted,
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